

Appendix E

Bank Visual Inspection Detailed Observations, Photographs, and Videos

1 Introduction

The Phase I bank inspection was conducted primarily by boat around daytime low tides (2 hours before, 2 hours after) on June 11, 16, 18, 23, and 26, and August 4, 2020. The inspection included the collection of videos, photographs, and detailed observations to document eastern and western bank conditions along the upper reach. During the planning phase of the program, periods of predicted daytime extreme low tides (i.e., near or less than 0 ft mean lower low water [MLLW]) were identified as potential survey dates, and actual inspection dates were selected based on forecasted weather conditions and team availability. Inspections also occurred at various times throughout the day to provide varying lighting conditions to capture photographs of both sides of the waterway. A summary of inspection dates, times, and tidal conditions is provided in Table E-1.

Table E-1
Bank Visual Inspection Date and Tide Details

Date	Approximate Time of Inspection	Predicted Low Tide Elevation (ft MLLW)	Time of Predicted Low Tide
June 11, 2020	1340–1715	0.3	1550
June 16, 2020	0730–1115	1.4	0913
June 18, 2020	0800–1150	-0.4	1012
June 23, 2020	1120–1550	-2.6	1316
June 26, 2020	1335–1600	-0.8	1534
August 4, 2020	1445–1545 ¹	-1.6	1215

Notes:

1. An additional bank visual inspection day was included to fill data gaps caused by an equipment issue on an earlier inspection day. The extreme low tide on this additional day made tidal conditions at the time of collection, which were outside the +/- 2-hour low tide time frame, comparable to tidal conditions on other inspection days.

The observations from the Phase I bank visual inspection are included in this appendix in tabular format. Photographs and videos have been provided to EPA digitally (on DVDs). This introduction provides information to facilitate review of the detailed observation table, photographs, and videos. Methods to collect this information are detailed in the PDI QAPP.

1.1 Detailed Observation Tables

Detailed observations are documented for each discrete shoreline segment, as defined by a change in bank structure classification, in tables presented in Attachments E-1a and E-1b. The discrete shoreline segments are differentiated from adjacent segments by alternating shading in the tables. The following information describes the various fields presented.

Station: Shoreline station locations can be found on Maps 2-4a through 2-4f of the main data evaluation report (DER). In Attachments E-1a and E-1b, stationing ranges that are left justified and

shown in bold in the “Station” column indicate the start and end point of the discrete shoreline segment. Subsequent stationing within a segment (right justified and non-bold) indicates point notes or observations within the segment.

Bank Type: The bank type is defined as one of the following: armored, unarmored (vegetated), unarmored (randomly armored), unarmored (exposed sediment), or bulkheaded.

Above Bank: Area generally above mean higher high water (MHHW).

- **Vegetation:** A “yes” or “no” indication of whether vegetation was observed above the bank.

Bank: Area below MHHW to transition to a connection point with sediment, generally accompanied by a change in the slope to a more gradual slope of the intertidal sediments.

- **Notes:** General conditions/observations of bank area.
- **Vegetation:** A “yes” or “no” indication of whether vegetation was observed in the bank.
- **Slope:** Estimated bank slope based on visual inspection and review of bathymetric data.
- **Erosion:** A “yes” or “no” indication of whether erosion was observed in the bank.

Vegetation Details: These columns may apply to both bank and above-bank areas and include descriptions of vegetation (if present).

- **Vegetation Description (% Cover):** Estimated percent cover of vegetation type (i.e., tree, shrub, grass/herbaceous, aquatic) observed in both the bank and area above the bank.
- **Plant Communities:** Abbreviated terms for species of trees, shrubs, and grass/herbaceous communities observed, as translated in Tables E-2 and E-3.

Table E-2
Plant Community Definitions

Plant Community	Species	Notes
Trees		
T1	ALRU, POBA, PONI, SABA	Dominated by native, typically overbank zone
T2	ALRU, ARME, PONI, POTR	Dominated by native, typically overbank zone
T3	ALRU, ARME, PIMO, POBA, POTR, PSME, THPL	Dominated by native, typically overbank zone
T4	PSME	Landscaping plantings
Shrubs		
S1	BUDA, RUAR	Dominated by non-native species
S2	BUDA, POCU, RUAR	Dominated by non-native species
S3	BUDA, HEHE, RUAR	Dominated by non-native species
S4	BUDA, CYSC, RUAR	Dominated by non-native species
S5	HODI, RONU, SARA	Dominated by native species, mitigation plantings
Grass, Ferns, Herbaceous		
GH1	ACMI, BRRA, CIAR, COAR, EQAR, FERU, HOLA, HYRA, LOCO, PLLA, SOAS, TAOF, TAVU	Dominated by non-native, typically includes a variety of these species
GH2	IRPS, JUEF, PHCO, SCAC	Wetland species, typically at or below OHWM
GH3	IRPS, JUEF, SCAC	Wetland species, typically at or below OHWM
GH4	DECE, PHAR	

Notes:

1. Plant community categories represent typically present and dominant species.
2. Categories are not intended to provide a comprehensive list of all species present.

Table E-3
Species Codes

Species Name	Common Name	Native/ Non-Native	Code
Trees			
<i>Alnus rubra</i>	Red alder	Native	ALRU
<i>Acer macrophyllum</i>	Big-leaf maple	Native	ACMA
<i>Arbutus menziesii</i>	Madrone	Native	ARME
<i>Betula papyrifera</i>	Paper birch	Native	BEPA
<i>Crataegus douglasii</i>	Douglas' hawthorn	Native	CRDO
<i>Fraxinus latifolia</i>	Oregon ash	Native	FRLA
<i>Malus pumila</i>	Cultivated apple	Non-native	MAPU
<i>Pinus contorta</i>	Shore pine	Native	PICO
<i>Pinus monticola</i>	Western white pine	Native	PIMO
<i>Populus balsamiera</i> <i>syn. trichocarpa</i>	Black cottonwood	Native	POBA
<i>Populus nigra</i>	Lombardy poplar	Native	PONI
<i>Prunus domestica</i>	Domestic plum	Native	PRDO
<i>Pseudotsuga menziesii</i>	Douglas fir	Native	PSME
<i>Quercus rubra</i>	Red oak	Native	QURU
<i>Salix babylonica</i>	Weeping willow	Native	SABA
<i>Salix scouleriana</i>	Scouler willow	Native	SASC
<i>Thuja plicata</i>	Western red cedar	Native	THGPL
Shrubs			
<i>Buddleia davidii</i>	Butterflybush	Non-native	BUDA
<i>Cytisus scoparius</i>	Scotch broom	Non-native	CYSC
<i>Hedera helix</i>	English ivy	Non-native	HEHE
<i>Holodiscus discolor</i>	Oceanspray	Native	HODI
<i>Polygonum cuspidatum</i>	Japanese knotweed	Non-native	POCU
<i>Rosa nutkana</i>	Nootka rose	Native	RONU
<i>Rubus armeniacus</i>	Himalayan blackberry	Non-native	RUAR
<i>Prunus laurocerasus</i>	European laurel	Non-native	PRLA
<i>Rubus ursinus</i>	Trailing blackberry	Native	RUUR
<i>Sambucus racemosa</i>	Red elderberry	Native	SARA
Grass, Ferns, Herbaceous			
<i>Achillea millefolium</i>	Yarrow	Native	ACMI
<i>Brassica rapa</i>	Common mustard	Non-native	BRRA
<i>Bromus tectorum</i>	Cheat grass	Non-native	BRTE
<i>Cirsium arvense</i>	Canada thistle	Non-native	CIAR
<i>Convolvulus arvensis</i>	Field bindweed	Non-native	COAR
<i>Deschampsia cespitosa</i>	Tufted hairgrass	Native	DECE
<i>Digitalis purpurea</i>	Foxglove	Non-native	DIPU
<i>Equisetum arvense</i>	Field horsetail	Native	EQAR
<i>Festuca rubra</i>	Red fescue	Non-native	FERU
<i>Holcus lanatus</i>	Velvet grass	Non-native	HOLA
<i>Hypochaeris radicata</i>	Hairy cat's-ear	Non-native	HYRA
<i>Iris pseudoacorus</i>	Yellow-flag iris	Non-native	IRPS
<i>Juncus effusus</i>	Soft rush	Non-native	JUEF
<i>Lotus corniculatus</i>	Birds-foot trefoil	Non-native	LOCO
<i>Phalaris arundinacea</i>	Reed canarygrass	Non-native	PHAR
<i>Phragmites communis</i>	Reed	Non-native	PHCO

Species Name	Common Name	Native/ Non-Native	Code
<i>Plantago lanceolata</i>	Narrow-leaved plantain	Non-native	PLLA
<i>Polystichum munitum</i>	Swordfern	Native	POMU
<i>Pteridium aquilinum</i>	Bracken fern	Native	PTAQ
<i>Ranunculus repens</i>	Creeping buttercup	Non-native	RARE
<i>Rumex crispus</i>	Curly dock	Native	RUCR
<i>Schoenoplectus acutus</i>	Hardstem bulrush	Native	SCAC
<i>Sonchus asper</i>	Prickly lettuce	Non-native	SOAS
<i>Tanacetum vulgare</i>	Common tansy	Non-native	TAVU
<i>Taraxacum officinale</i>	Common dandelion	Non-native	TAOF

Bank Transition Elevation: Estimated transition point between the bank and transition below bank based on review of photographs and bathymetric surveys.

Transition Below Bank: Area below bank observed during the low-tide inspections.

- **Notes:** General conditions/observations of area below the bank.
- **Vegetation:** A "yes" or "no" indication of whether vegetation was observed below the bank.
- **Slope:** Estimated slope of area below the bank based on visual inspection and review of bathymetric survey data.
- **Erosion:** A "yes" or "no" indication of whether erosion was observed below the bank.

General Notes: General notes that may apply to the entire segment, regardless of location above, on, or below the bank.

Photographs: Number of photographs that correspond to segments or point observations. Each photograph included with this appendix includes the prefix "DSCN0XXX." The number included in the table refers to the last three digits of the overall photograph title.

1.2 Photographs

Photographs were collected using a GPS-enabled and compass-enabled camera that recorded direction and position for every photograph taken. Photographs were taken to provide near-complete coverage of the upper reach banks, from river mile (RM) 3.0 to RM 5.0 on the west and east banks. Photographs are provided by 0.2-RM increments on the DVDs (Attachment E-2). Location information is also included in Attachments E-1a and E-1b.

1.3 Videos

Videos were collected in approximately 0.2-RM increments as tabulated in Table E-4 and provided in Attachment E-3 (DVDs). The videos were narrated to identify notable features observed along the banks.

Table E-4
Bank Visual Inspection Video Index

Title	Site Coverage	Date	Time
E_Downstream_RM_3.0	Downstream of RM 3.0 (east bank)	6/11/20	1635
E_RM_3.2_3.0	RM 3.2 to RM 3.0 (east bank)	6/11/20	1634
E_RM_3.4_3.2	RM 3.4 to RM 3.2 (east bank)	6/11/20	1629
E_RM_3.6_3.4	RM 3.6 to RM 3.4 (east bank)	6/11/20	1622
E_RM_3.8_3.6	RM 3.8 to RM 3.6 (east bank)	6/11/20	1616
E_RM_4.0_3.8	RM 4.0 to RM 3.8 (east bank)	6/11/20	1611
E_RM_4.2_4.0	RM 4.2 to RM 4.0 (east bank)	6/23/20	1217
E_RM_4.2_Slip 6	Slip 6	6/16/20	0759
E_RM_4.4_4.2	RM 4.4 to RM 4.2 (east bank)	6/23/20	1211
E_RM_4.6_4.4	RM 4.6 to RM 4.4 (east bank)	6/23/20	1205
E_RM_4.8_4.6	RM 4.8 to RM 4.6 (east bank)	6/11/20	1546
E_RM_5.0_4.8	RM 5.0 to RM 4.8 (east bank)	6/11/20	1541
E_Upstream_RM_5.0	Upstream of RM 5.0 (east bank)	6/11/20	1529
W_RM_3.0_3.2	RM 3.0 to RM 3.2 (west bank)	6/11/20	1451
W_RM_3.2_3.4	RM 3.2 to RM 3.4 (west bank)	6/11/20	1503
W_RM_3.4 (South Park Marina - North End)	South Park Marina (north end)	6/23/20	1546
W_RM_3.4 (South Park Marina - South End)	South Park Marina (south end)	6/23/20	1548
W_RM_3.5_3.6	RM 3.5 to RM 3.6 (west bank)	6/11/20	1508
W_RM_3.6_3.8	RM 3.6 to RM 3.8 (west bank)	6/23/20	1130
W_RM_3.8_4.0	RM 3.8 to RM 4.0 (west bank)	6/23/20	1135
W_RM_4.0_Kelly Ryan	National Industrial Holding	6/16/20	1023
W_RM_4.2_4.4	RM 4.2 to RM 4.4 (west bank)	6/23/20	1144
W_RM_4.2_Delta Marine	Delta Marine Industries, Inc.	6/16/20	0953
W_RM_4.4_4.6	RM 4.4 to RM 4.6 (west bank)	6/23/20	1150
W_RM_4.6_4.8	RM 4.6 to RM 4.8 (west bank)	6/23/20	1519
W_RM_4.8_5.0	RM 4.8 to RM 5.0 (west bank)	6/23/20	1523
W_Upstream_RM_5.0	Upstream of RM 5.0 (west bank)	6/23/20	1523

2 Attachments

Attachment E-1a	LDW Detailed Observation Notes Compilation, East Bank (Stations 250.5-381)
Attachment E-1b	LDW Detailed Observation Notes Compilation, West Bank (Stations 381-521.5)
Attachment E-2	Photographs (provided separately to EPA on DVD)
Attachment E-3	Videos (provided separately to EPA on DVD)

Appendix E

Attachments E-1a and E-1b

Attachment E-1a
LDW Detailed Observation Notes Compilation, East Bank (Stations 250.5-381)

Station	Bank Type	Above Bank	Bank				Vegetation Description (Applies to Above Bank and Bank)					Bank Transition Elevation (ft MLLW)
		Vegetation (Y/N)	Notes ¹	Vegetation (Y/N)	Slope ²	Erosion (Y/N)	% cover				Plant Communities	
							Tree	Shrub	Grass/ Herbaceous	Aquatic		
250.5-253 (RM 3.0-3.02)	Armored	Y	Large armor	Y	2H:1V	N	30	80	20	0	T1/S1/GH1	+4
253			OF01									
253-265 (RM 3.02- 3.25)	Bulkheaded (ST01)	N	Horizontal timber lagging wall with armor at toe and below building	N	Vertical	N	0	0	0	0	GH1	+4
256.3												
263												
265-268.5 (RM 3.25-3.35)	Armored	N	Armored	Y	2H:1V	N	0	60	40	0	None	+4
266			OF02		-							
266.5-267.5			ST02									
267			OF03									
267-268.5		N		Y				0	100	0	0	
268.5-283.3 (RM 3.35-3.55)	Unarmored (Vegetated)		Habitat area, wood debris		5H:1V	N						+6 and above
268-281		N		Y			30	40	30	10	T4/S5/GH1/GH4	
279-280.1												
281-283		N		Y			0	20	20	0	S1/GH1	
283.3-289.4 (RM 3.55-3.65)	Armored	N	Riprap medium to large, transitioning to gravel at +3' MLLW	Y	2.5H:1V	N	0	20	20	0	S1/GH1	Lower than observed tide level
284.1			Sheetpile structure									
289.4-298.2 (RM 3.65-3.8)	Bulkheaded (ST03)	Y	Bulkhead of varying composition (steel, concrete, timber, etc.)	N	Vertical	N	10	60	30	0	S1/GH1	Varies (0 to +4)
289.9			OF04									
290.8			OF05									
293-294.1			Debris piles									
295.5-298		Y		N			0	10	0	0	S1	
296.3			OF06									
298.2- 301.5 (RM 3.8-3.88)	Unarmored (Vegetated)	Y	Soil and vegetation behind short, vertical timber pile wall	Y	Vertical	N	20	70	20	0	T3/S1/GH1	+6
301.5- 306.2 (RM 3.88-3.95)	Bulkheaded (ST03)	Y	Steel sheetpile miscellaneous armor at toe of wall	Y	Vertical	N	20	70	20	0	T3/S1/GH1	+4
301.1			OF07									
306.2-310 (RM 3.95-4.05)	Armored	Y	Riprap with vegetation (possible sheetpile wall above riprap)	Y	2H:1V	N	20	70	20	0	T3/S1/GH1	Varies (+4 to +6)
306.9			OF08									
310-315 (RM 4.05-4.1)	Unarmored (Discontinuous Armoring)	Y	Miscellaneous armor	Y	3H:1V	N						+6
311												
311.4												
312.2-314			Large concrete debris riprap									
314												

Attachment E-1a
LDW Detailed Observation Notes Compilation, East Bank (Stations 250.5-381)

Station	Bank Type	Above Bank	Bank				Vegetation Description (Applies to Above Bank and Bank)					Bank Transition Elevation (ft MLLW)
		Vegetation (Y/N)	Notes ¹	Vegetation (Y/N)	Slope ²	Erosion (Y/N)	% cover				Plant Communities	
							Tree	Shrub	Grass/ Herbaceous	Aquatic		
315-350.5 (RM 4.1-4.4)	Armored		Vegetation over riprap	Y	2H:1V	N						Varies (Lower than observed tide level to +6)
315.6-317.7												
318-325.5		Y		Y			30	70	20	0	T2/S2/GH1	
324.4			OF09									
325.5-327.5		N		Y			40	60	30	0	T2/S2/GH1	
327.5-328.5		Y		Y			20	80	20	0	T1/S1/GH1	
326.5												
327.8			OF10									
328.6-341			ST05									
337			OF11									
341.4-350.5		Y	Uniform slope of medium to large armor with vegetation at top of slope				50	60	20	0	T3/S1/GH1	
344.3- 350.5		Y		Y			50	60	20	0	T3/S1/GH1	
347.4			OF12									
349.2			OF13									
349.6			OF14									
350.5-355.5 (RM 4.4-4.48)	Unarmored (Discontinuous Armoring)	Y	Intermittent/irregular armoring, exposed sand and silt, vegetation at top of slope	Y	4H:1V	N	0	90	10	0	S1	+4
350.4-350.9			ST06									
351.2			OF15									
355.5-361 (RM 4.48-4.65)	Armored	N	Intermittent/irregular armoring, exposed sand and silt, vegetation at top of slope	Y	4H:1V	N	10	60	30	0	T2/S3/GH0	Varies (+2 to +4)
356												
357												
358.5												
358.8			OF16									
359.8-360.1												
361-369 (RM 4.65-4.82)	Unarmored (Discontinuous Armoring)	Y		Y	2H:1V to 5H:1V	N	10	60	30	0	T2/S3/GH1	Varies (+4 to +6)
361-363.3			Random armoring with vegetation above									
361.2-361.5			ST07									
363.4-364.6			Sparse armor, vegetation above									
364.3												Lower than observed tide level
364.8-366.3			ST07									
365.6												
366.3-369.8			Large concrete debris riprap									
369-371 (RM 4.82-4.85)	Armored		Mix of concrete and large riprap armor		2H:1V	N						Varies (+2 to +6)
369.8-370.2		N	ST08	N			0	0	0	0	None	
370.2-370.7		Y		Y			40	60	25	1	T3/S1/GH1/GH2	
370.7-372.5		Y	Armor in some places	Y			40	60	25	1	T3/S1/GH1/GH2	
370.9			OF17									

Attachment E-1a
LDW Detailed Observation Notes Compilation, East Bank (Stations 250.5-381)

Station	Bank Type	Above Bank	Bank				Vegetation Description (Applies to Above Bank and Bank)					Bank Transition Elevation (ft MLLW)
		Vegetation (Y/N)	Notes ¹	Vegetation (Y/N)	Slope ²	Erosion (Y/N)	% cover				Plant Communities	
							Tree	Shrub	Grass/ Herbaceous	Aquatic		
371-378 (RM 4.85-4.97)	Unarmored (Discontinuous Armoring)	Y		Y	Vertical to 4H:1V	N	40	60	25	1	T3/S1/GH1/GH2	Varies (+2 to +6)
371.5-376			Exposed sediment with occasional concrete/rock/wood debris	Y								
372.5-373.4												
373.4-375.8												
375			OF18									
376-376.6												
376.3			OF19									
376.6-378			Large random armoring (concrete and rock)									
378-380.8 (RM 4.97 to 5.0)	Bulkheaded (ST09)	Y		N	Vertical	N	0	0	0	0	None	+2
378.8-380			ST09									
380-380.8			Armor at toe of bulkhead									
380.8-381	Unarmored (Discontinuous Armoring)	Y	Random armoring with vegetation above	N	4H:1V	N						+2

Attachment E-1a
LDW Detailed Observation Notes Compilation, East Bank (Stations 250.5-381)

Station	Transition Below Bank				General Notes	Photographs
	Notes	Vegetation (Y/N)	Slope ²	Erosion (Y/N)		
250.5-253 (RM 3.0-3.02)	Exposed sediment	N	5H:1V	N		908-912
253						907
253-265 (RM 3.02- 3.25)	Unarmored	N	6H:1V	See below	Armor presence and condition varies. Timber bulkhead and timber pile supported building with some riprap and concrete below	876-907
256.3	Erosion channel			Y		897
263	Erosion features			Y		879
265-268.5 (RM 3.25-3.35)	Sediment with more gravel on upper portion of lower slope	N	5H:1V	See below	Vegetation above, transition between bulkhead wall and large riprap slope	871-875
266	Erosion visible		-	Y		873
266.5-267.5				N		870-873, 945-950
267				N		870
267-268.5		N		N		868-870
268.5-283.3 (RM 3.35-3.55)	Mixed sand and gravel		5H:1V	N	Boeing Plant 2 Early Action Area (Station 268.5 to 283.3)	853-867
268-281		Y				
279-280.1	Increased gravel content in surface sediments					624, 625, 854
281-283		N				
283.3-289.4 (RM 3.55-3.65)	Not observed		Not observed	n/a	Jorgensen Forge Early Action Area (Station 283.3 to 291.6)	599-613
284.1						611
289.4-298.2 (RM 3.65-3.8)	Unarmored (sand and gravel), miscellaneous debris	N	5H:1V	See below		575-598, 848,963, 964
289.9				N		598
290.8				N		595
293-294.1	Sediments gravel and sand			N		588-589
295.5-298		N		N		
296.3	Erosion channel			Y		581-582, 851-852
298.2- 301.5 (RM 3.8-3.88)	Unarmored exposed sand and silt	N	6H:1V	N		841-847
301.5- 306.2 (RM 3.88-3.95)	Unarmored exposed sand, gravel, and silt	N	6H:1V to flat	N		828-840
301.1						
306.2-310 (RM 3.95-4.05)	Exposed sediment	N	5H:1V	N	Miscellaneous wood debris	808-823
306.9						827
310-315 (RM 4.05-4.1)			6H:1V to flat	N		814-822
311	Concrete debris					821
311.4	Pile					820
312.2-314						815-819
314	ST04					816

Attachment E-1a

LDW Detailed Observation Notes Compilation, East Bank (Stations 250.5-381)

Station	Transition Below Bank				General Notes	Photographs
	Notes	Vegetation (Y/N)	Slope ²	Erosion (Y/N)		
315-350.5 (RM 4.1-4.4)	Riprap with sediment accumulation at lower elevations	N	6H:1V to flat; not observed from 318-350.5	See below		62-92, 790-813
315.6-317.7	Large, flat exposed bank			N		807-813
318-325.5		N		N		
324.4				N		69
325.5-327.5		N		N		
327.5-328.5		N		N		
326.5	Erosion at transition to bank zone (vertical bank in tree roots)			Y		66
327.8				N		63
328.6-341				N		30-61, 93-123, 981-982
337				N		40
341.4-350.5	Flat exposed bank	N		N		790-804
344.3- 350.5	Gravel	N		N		790-798
347.4				N		792-793
349.2				N		790
349.6	Dolphin pile			N		789
350.5-355.5 (RM 4.4-4.48)	Flat exposed bank	N	6H:1V	N		491-505, 789
350.4-350.9						986, 989
351.2						501
355.5-361 (RM 4.48-4.65)	Gravel below toe of riprap	N	6H:1V	See below		467-485
356	Erosion channel			N		483
357	Erosion			Y		480
358.5	Erosion			Y		477
358.8				N		475
359.8-360.1	Dolphin piles			N		471
361-369 (RM 4.65-4.82)		N	5H:1V	N		442-467
361-363.3						458-466
361.2-361.5						465-466, 998,1000
363.4-364.6	Large exposed bank, sand and sediment					449- 457
364.3	ST07					455
364.8-366.3	Exposed bank					449-454
365.6	ST07					451
366.3-369.8	ST07					
369-371 (RM 4.82-4.85)	Exposed sediment		3H:1V	See below		436-442
369.8-370.2		N		N		438-441, 1003-1006
370.2-370.7	ST07	Y		N		436-439
370.7-372.5	Erosion, wood debris	Y		Y		434-437
370.9						435

Attachment E-1a
LDW Detailed Observation Notes Compilation, East Bank (Stations 250.5-381)

Station	Transition Below Bank				General Notes	Photographs
	Notes	Vegetation (Y/N)	Slope ²	Erosion (Y/N)		
371-378 (RM 4.85-4.97)			4H:1V to flat	Y		406-436
371.5-376	Exposed sediment	Y		Y	Norfolk Early Action Area (Station 372.8 to 377.4)	421-433
372.5-373.4	ST07			N		428-431
373.4-375.8	Exposed sediment, erosion			Y		421-427
375	Erosion channel			Y		424
376-376.6	Large exposed bank, sand and sediment	Y		Y		419-421
376.3						420
376.6-378	Exposed bank, sand and sediment	Y		N		412-418
378-380.8 (RM 4.97 to 5.0)	Exposed bank	N	6H:1V	N		407-413
378.8-380	Exposed bank, timber debris					408-411
380-380.8	Timber debris					405-406
380.8-381	Exposed bank, timber debris	N	6H:1V	N		407

Attachment E-1b
LDW detailed Observation Notes Compilation, West Bank (Stations 381.5-521.5)

Station	Bank Type	Above Bank	Bank				Vegetation Description (Applies to Above Bank and Bank)					Bank Transition Elevation (ft MLLW)
		Vegetation (Y/N)	Notes ¹	Vegetation (Y/N)	Slope ²	Erosion (Y/N)	% cover				Plant Communities	
381.5-384 (RM 4.95-5)	Armor				2H:1V	N						Varies (Lower than observed tide to +4)
384-386 (RM 4.92-4.95)	Unarmored (Discontinuous Armoring)	N	Concrete debris	Y	4H:1V	N	80	80	10	0	T1/S1/GH1	Varies (+2 to +4)
386-387 (RM 4.9-4.92)	Armored				3H:1V	N						+2
385-387.2			Wood and concrete debris									
387-388.4 (RM 4.88-4.92)	Unarmored (Vegetated)				4H:1V to flat	N						+6
387.2-388.4												
387.2-388.2												
388.4-389.5 (RM 4.85-4.88)	Armored				2H:1V	N						+6
389.5-420.5 (RM 4.65-4.85)	Unarmored (Vegetated)		Vegetation		5H:1V to flat							Varies (+4 to +8)
390.7-391.2		N	ST08	N			0	0	0	0	None	
391.3-406.7		Y		Y			40	70	20	0	T1/S3/GH1	
396.4			Derelict vessel									
397-407			Shallow inlet, inspected from a distance									
411			ST10									
407-420.3		Y		Y		N	60	60	20	20	T3/S1/GH1/GH3	
420.5-423.3 (RM 4.62-4.65)	Armored	N	Small armor	Y	3H:1V	N	10	90	30	0	S1/GH1	+6
423.3-431 (RM 4.52-4.62)	Unarmored (Vegetated)	Y	Vegetation	Y	6H:1V to flat	N	60	60	20	10	T1/S1/GH1/GH3	+6
426.7			Stormdrain; some armor									
429.8			Stormdrain									
430.3-431												
431-438.4 (RM 4.4-4.52)	Armored		Armored wall, steep armored shoreline	Y	2H:1V	N	30	40	30	10	T1/S1/GH1	Varies (Lower than observed tide level to +4)
433.9			OF21									
435-436												
437			Large armor									
437.8-438.5			ST06									
438.4-447 (RM 4.25-4.4)	Unarmored (Vegetated)	Y	Smaller armoring	Y	4H:1V to flat	N	80	80	10	10	T3/S1/GH4	+6
438.9-439.8												
440-443												
447-452 (RM 4.18-425)	Bulkheaded (ST12)	N	Bulkhead of varying composition (steel, concrete)	N	Vertical	n/a	0	0	0	0	None	0
450.9			Storm drain in bulkhead									
451.7			ST13									
452-462.6 (RM 4.03-4.18)	Armored	N	ST15; Vegetation at top of armor slope of various size	Y	2H:1V	N	30	60	40	0	T3/S2/GH1	Lower than observed tide level
452-452.5			Bulkhead									
454.1			OF22									
455.1-455.9			Bulkhead/ST14									
462.6-463.7 (RM 4.01-4.03)	Unarmored (Discontinuous Armoring)	Y	Exposed shallow slope	Y	4H:1V	N	30	80	20	10	T4/S4/GH1/GH4	+4

Attachment E-1b
LDW detailed Observation Notes Compilation, West Bank (Stations 381.5-521.5)

Station	Bank Type	Above Bank	Bank				Vegetation Description (Applies to Above Bank and Bank)					Bank Transition Elevation (ft MLLW)			
		Vegetation (Y/N)	Notes ¹	Vegetation (Y/N)	Slope ²	Erosion (Y/N)	% cover				Plant Communities				
							Tree	Shrub	Grass/ Herbaceous	Aquatic					
463.7-465.1 (RM 3.98-4.01)	Armored	N	Armored slope under dock	N	2H:1V	N	0	0	0	0	None	0			
463.7			Dolphin pile												
464.1-465.1			ST16		Vertical										
465.1-483.7 (RM 3.68-3.98)	Unarmored (Discontinuous Armoring)		Intermittent armor		4H:1V to 5H:1V	N						Varies (+4 to +6)			
465.1-471.3			Vegetation												
465.1-468.5		Y		Y			20	90	20	0	T4/S4/GH1				
468.5-471.3		Y	ST17	Y			40	80	10	0	T1/S3/GH1				
471.3-483.7		Y	Intermittent armor rock and miscellaneous debris	Y			40	80	10	0	T1/S3/GH1				
473			ST18												
476.7															
477.7			OF23												
481															
483			Exposed, vertical soil												
483.7-486.1 (RM 3.63-3.68)		Armored		Medium to small armor			2H:1V	N							+2
483.7-486.1			Y		Y				0	20	70		0	T1/S1/GH1	
486.1-489.3 (RM 3.56-3.63)	Bulkheaded (ST19)	Y	Steel sheetpile wall with Armored toe	N	Vertical	n/a	10	10	0	0	T1/S1	+2			
489.3															
489.3-499.7 (RM 3.36-3.56)	Armored		Steep armor, pockets of vegetation		2H:1V	N						Lower than observed tide level			
489.3-492.2			Vegetation/pavement												
489.3-490.5		Y		Y			10	10	40	0	T1/S1/GH1				
492.2			OF24												
492.2-499.7			Ecology block wall												
490.5-499.5		Y	ST20	Y			5	5	15	0	T1/S1/GH1				
497.2			Newer ecology block wall												
499.7			Boat launch												
499.7-502.5 (RM 3.32-3.36)	Unarmored (Discontinuous Armoring)		Habitat area, wood debris		3H:1V to 5H:1V	N						+6			
499.7-502		Y		Y			10	50	40	1	T3/S3/GH1				
500			OF25												
501.1-502			ST02												
502.5-503.4 (RM 3.30-3.32)	Armored	Y	Riprap slope	Y	3H:1V	N	10	50	40	1	T3/S3/GH1	+6			
503.4-505 (RM 3.26-3.30)	Unarmored (Discontinuous Armoring)	Y		Y	3H:1V	N	10	50	40	1	T3/S3/GH1	+6			
503-520.5			ST21												
505			Exposed soil at top of slope												
505-506.7 (RM 3.25-3.26)	Armored			Y	2H:1V	N	10	50	40	1	T3/S3/GH1	Varies (lower than observed tide level to +2)			
506-507			Concrete bulkhead above armor												
506.7-512.5 (RM 3.15-3.25)	Unarmored (Discontinuous Armoring)				2H:1V	N						Lower than observed tide level			
507			Boat launch												
507.1			Debris wall above armor												
508			OF26												
508-509.2			Rock wall above armor												

Attachment E-1b
LDW detailed Observation Notes Compilation, West Bank (Stations 381.5-521.5)

Station	Bank Type	Above Bank	Bank				Vegetation Description (Applies to Above Bank and Bank)					Bank Transition Elevation (ft MLLW)
		Vegetation (Y/N)	Notes ¹	Vegetation (Y/N)	Slope ²	Erosion (Y/N)	% cover				Plant Communities	
512.5-518 (RM 3.05-3.15)	Armored	Y	Large armor	Y	2H:1V	N	10	50	40	1	T3/S3/GH1	Lower than observed tide level
512.9			Brick wall above armor									
518-521.5 (RM 3-3.05)	Unarmored (Discontinuous Armoring)	Y	Aquatic vegetation	Y	4H:1V to flat	N	50	40	30	0	T3/S1/GH4	Varies (+4 to +8)
520-520.8			Small armor									

Attachment E-1b
LDW detailed Observation Notes Compilation, West Bank (Stations 381.5-521.5)

Station	Transition Below Bank				General Notes	Photographs
	Notes	Vegetation (Y/N)	Slope ²	Erosion (Y/N)		
381.5-384 (RM 4.95-5)	Armor with sediment on top		5H:1V	Y		394-403
384-386 (RM 4.92-4.95)	Exposed bank, erosion feature	Y	5H:1V	Y		388-392
386-387 (RM 4.9-4.92)			3H:1V	N		384-387
385-387.2	Armor with sediment on top					384-391
387-388.4 (RM 4.88-4.92)			6H:1V to flat	See below		380-383
387.2-388.4	Exposed sediment, erosion area			Y		375-383
387.2-388.2	Large wood debris			N		382-383
388.4-389.5 (RM 4.85-4.88)	Exposed sediment, erosion area		4H:1V to flat	Y		376-379
389.5-420.5 (RM 4.65-4.85)	Exposed sandy silt		Flat			356-381
390.7-391.2		N				375-376,1002-1008
391.3-406.7		N				
396.4						367, 369
397-407						366-369
411						364
407-420.3		Y				
420.5-423.3 (RM 4.62-4.65)	Exposed sediment, small erosion channels	N	Flat	N		356
423.3-431 (RM 4.52-4.62)	Sand and silt beach	Y	Flat	N		346-355
426.7						347
429.8						345
430.3-431	Exposed sediment, undulating					345-346
431-438.4 (RM 4.4-4.52)		Y	2H:1V to flat	Y		320-344
433.9						335-336
435-436	Smaller gravel					330-333
437	Exposed sediment					325-326
437.8-438.5						322, 988
438.4-447 (RM 4.25-4.4)	Exposed sand and silt	Y	4H:1V to flat	See below		300-319
438.9-439.8	Erosion feature			Y		319
440-443	ST11			N		300-302, 306-312, 315-316
447-452 (RM 4.18-425)	Not observed	N	Not observed	n/a	Delta Marine Industries facility No bank erosion except at travel lift shoreline No observed debris, navigational obstructions, utility crossings	124-137, 298, 978-980, 983-984
450.9						126-127
451.7						978
452-462.6 (RM 4.03-4.18)	Not observed	Y	Not observed	N	Duwamish Yacht Club	276-297, 970-971, 974-975,
452-452.5						
454.1						296
455.1-455.9						294
462.6-463.7 (RM 4.01-4.03)	Sediment with debris	Y	4H:1V	N	Miscellaneous debris, including old barge at 462.7	138-140

Attachment E-1b
LDW detailed Observation Notes Compilation, West Bank (Stations 381.5-521.5)

Station	Transition Below Bank				General Notes	Photographs
	Notes	Vegetation (Y/N)	Slope ²	Erosion (Y/N)		
463.7-465.1 (RM 3.98-4.01)	Not observed	N	Not observed	N	National Industrial Holding facility (also referred to as Kelly Ryan Inc.)	140-141, 150-154
463.7						140
464.1-465.1	Lightly armored bank up to bulkhead					150-154, 969
465.1-483.7 (RM 3.68-3.98)		N	4H:1V to 5H:1V	N		145-149, 245-275
465.1-471.3	Exposed sand and gravel					145-149, 273-275
465.1-468.5		N				
468.5-471.3		N				272
471.3-483.7	Exposed sand and gravel	N	6H:1V			245-272
473						267
476.7	3 piles					258-259
477.7						
481	Wood debris					249
483						244
483.7-486.1 (RM 3.63-3.68)	Exposed sand and silt		5H:1V	N	T-117 Early Action Area (Station 483.2 to 492.3)	237-242
483.7-486.1		N				
486.1-489.3 (RM 3.56-3.63)	Exposed sand and silt	N	3H:1V	N		, 958, 960
489.3	Piles					227
489.3-499.7 (RM 3.36-3.56)	Not observed		Not observed	N		215-225, 767-787
489.3-492.2	Armored slope					219-226
489.3-490.5		N				
492.2						219
492.2-499.7	Steep armor, pockets of vegetation				South Park Marina	767-787
490.5-499.5		N				778, 767-787, 952, 956-957
497.2						772
499.7						215, 951
499.7-502.5 (RM 3.32-3.36)	Exposed bank, gravel		4H:1V	N		206-214
499.7-502		Y				
500						213
501.1-502					South Park Bridge	208-210
502.5-503.4 (RM 3.30-3.32)	Exposed bank, some scattered small riprap		6H:1V	N		202-205
503.4-505 (RM 3.26-3.30)			6H:1V	N		199-201
503-520.5						167-205
505					Brick armor	
505-506.7 (RM 3.25-3.26)		Y	Not observed in areas; 3H:1V	N		194-198
506-507						194-196
506.7-512.5 (RM 3.15-3.25)	Not observed		Not observed	N		178-193
507						162-193
507.1						191-192
508						189
508-509.2						184-190

Attachment E-1b
LDW detailed Observation Notes Compilation, West Bank (Stations 381.5-521.5)

Station	Transition Below Bank				General Notes	Photographs
	Notes	Vegetation (Y/N)	Slope ²	Erosion (Y/N)		
512.5-518 (RM 3.05-3.15)	Not observed	Y	Not observed	N	Large riprap used as armoring	160-177
512.9	-		-			176
518-521.5 (RM 3-3.05)	Exposed sediment	N	4H:1V to 6H:1V	See below	Park habitat area in embayment	155-159
520-520.8	Exposed sediment, Erosion visible			Y	Armored with a mix of rock, concrete slab, and cinder blocks	155-157

Notes and Legend for Tables E-1a and E-1b

- Notes:
- 1. Refer to Appendix F for detailed information on structures and outfalls (identified in this table as STXX and OFXX).
 - 2. All slopes are estimated.
 - 3. All transition elevations between upper and lower slopes are estimated.
 - 4. The only observed utility crossing in the Upper Reach was an overwater powerline near River Mile 4.4.
 - 5. Access points for future sampling events (including nature and condition) can be identified in the videos and photographs collected during this field investigation.
 - 6. Navigation obstructions or nearby structures that could indicate waterway traffic or current flow patterns that could affect the stability of the armoring or bank were noted where observed.
- More information on navigation obstructions and structures is available in separate structures forms.

Abbreviations:
MLLW: Mean Lower Low Water
RM: River mile